



ZIMBABWE



RARE EARTH ELEMENTS IN ZIMBABWE

GEOLOGICAL SURVEY DEPARTMENT

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INTRODUCTION

1. Rare earth elements (REE) are a group of seventeen metals with unique properties that make them critical in the manufacturing of high technology gadgets that people use every day.
2. The 17 REE are cerium (Ce), dysprosium (Dy), erbium (Er), europium (Eu), gadolinium (Gd), holmium (Ho), lanthanum (La), lutetium (Lu), neodymium (Nd), praseodymium (Pr), promethium (Pm), samarium (Sm), scandium (Sc), terbium (Tb), thulium (Tm), ytterbium (Yb), and yttrium (Y).
3. Currently China is the main driver in the supply and demand for these commodities. The country is the world's leading producer, contributing over 90 percent of the world's supply.
4. Zimbabwe has a unique geological environment comprising varied rocks spanning a period of over 3000 million years, which are favourable to occurrences of a variety of mineral commodities and deposits including REE.
5. In Zimbabwe REE have been found associated with some carbonatites, pegmatites, and concentrated in alluvium in some rivers especially in the south-central part of the country.

IMPORTANCE OF RARE EARTH ELEMENTS

6. Neodymium

Permanent magnet technology has been revolutionized by alloys containing Nd, Sm, Gd, Dy, or Pr. Small, lightweight, high-strength REE magnets have allowed miniaturization of numerous electrical and electronic components used in appliances, audio and video equipment, computers, automobiles, communications systems, and military gear. Magnets containing neodymium are also used in green technologies such as the manufacture of wind turbines and hybrid cars. In the military, neodymium is used for laser range-finders, guidance systems, and communications

7. Lanthanum

This element is used in camera and telescope lenses. Compounds containing lanthanum are used extensively in carbon lighting applications, such as studio

lighting and cinema projection. In the military, lanthanum is used for manufacturing night vision goggles.

Rechargeable lanthanum-nickel-hydride (La-Ni-H) batteries are gradually replacing Ni-Cd batteries in computer and communications applications and could eventually replace lead-acid batteries in automobiles.

8. Cerium

Cerium, the most abundant and least expensive REE, has dozens of applications, some highly specific. For example, Ce oxide is uniquely suited as a polishing agent for glass. Virtually all polished glass products, from ordinary mirrors and eyeglasses to precision lenses, are finished with CeO_2 .

Cerium is also used in catalytic converters in cars, enabling them to run at high temperatures and playing a crucial role in the chemical reactions in the converter. Lanthanum and cerium are also used in the process of refining crude oil.

9. Praseodymium

Used to create strong metals for use in aircraft engines. Praseodymium is also a component of a special sort of glass, used to make visors to protect welders and glassmakers.

10. Gadolinium

Used in X-ray and scanning systems, and also in television screens. Research is also being done into its possible use in developing more efficient refrigeration systems.

11. Yttrium, terbium, europium

Important in making televisions and computer screens and other devices that have visual displays as they are used in making materials that give off different colours. Europium is also used in making control rods in nuclear reactors, and in the making of fluorescents and phosphors in lamps and monitors for the military.

12. Samarium

Important in the manufacture of permanent magnets that are stable at high temperatures, and for precision-guided weapons and stealth technology in military

14. Although the country has certain geological settings that could be considered for searching for REE, there has not been any systematic exploration for the commodities.

15. Information about possible occurrences of REE in Zimbabwe was generated in the mid-1940s during a United Kingdom Atomic Energy Authority (UKAEA) programme for searching of uranium and thorium in Commonwealth countries.

16. Although the programme led to identification of REE occurrences in some geological units, the combined factors that the Agency was looking for uranium, and that the rare earth minerals are weakly radioactive, led to the overlooking of deposits of REE. Once a radioactive anomaly was found to be the result of a rare earth mineral, no further investigations were carried out since REE were not important at that time.

17. There are however a few prospects with information suggesting possible occurrences of commercial deposits of REE. These are:

Name and type	Location	Tenure	Comments
1. Katete Carbonatite	Binga	Covered by base metal blocks belonging to Katete Minerals belonging to a Bulawayo based geologist, Richard Dollar. No activities on the ground	Contains high concentrations of REE combined with phosphate. Explored in the 1960s and 2000s. Mineralization includes Dy, Ce, La, Sm and Y. Total rare earth oxide was 14.6% (13.2% cerium and 0.6% lanthanum), with an average of 1.74% total rare earth oxide. Ownership needs to be ascertained.
2. Gungwa Carbonatite	Rushinga	One special block belonging to Kushanda Resources although information on internet show Rainbow Rare Earths of UK claiming ownership	Several thousand parts per million of REE. Rainbow Rare Earths Ownership needs to be ascertained
3. Nanuta Carbonatite	Mt Darwin	Rainbow Rare Earths of UK claims ownership	Not much information, but has been shown to be enriched in REE

4. Mutondongwe Carbonatite	Guruve	Rainbow Rare Earths of UK claims ownership	Ownership needs to be ascertained Not much information although reported to be enriched in Ce and La
5. Dorowa Carbonatite	Buhera	Dorowa Minerals	Ownership needs to be ascertained Active mine for phosphate. Reported to be poorly mineralized in REE although further assessments may be required
6. Shawa	Buhera	Shawa Vermiculite Mines and Dinhidza Mining	Active vermiculite mines. Also a known deposit of phosphate. Reported to be poorly mineralised in REE although further assessments are necessary
7. Chishanya carbonatite	Buhera	Carbonatite Resources SG6988; Eastern Deep SG7229; Prospect Resources	Has economic resources of phosphate, and is suspected to be enriched in REE Ownership needs to be ascertained to check if there are no overlaps
8. Lubimbi placer deposit	Hwange	Four base metal blocks belonging to Rhomet belonging to a Bulawayo based geologist, Richard Dollar	Sediments containing rare earth mineral comprising about 1% of the rock. Mainly xenotime, a yttrium phosphate.
9. Devure – Mungezi river alluvium	Gutu	Most likely free. Pegged by the Rhodesia Chrome Mines in the 1940s.	Monazite (Ce, La) and alanite (Ce, Y) rich alluvium, comprising 10 – 33% of the sand along Dewure and Mungezi rivers close to the confluence. Ownership needs to be ascertained
10. Link alluvium deposit	Gutu. Near Bikita Pegmatites where Mungezi River crosses into Gutu.	Most likely free	Alluvium containing 14.5% monazite grains. Several tonnes of monazite produced in the 1950s. Ownership needs to be ascertained
11. Smokey pegmatite deposit	Mberengwa, south of Buchwa	TBA	Rich in euxenite (Y, Ce, Er). Produced 3.63 t of euxenite in 1966.
12. Byerley pegmatite and gneiss deposit	Beitbridge	TBA	Mineralization in pegmatites and hosting gneisses in the form of yttriotitanite (Y, Ce) and yttriotantalite (Y, Er, Ce)

WAY FORWARD

18. Since projections are that the demand for REE will continue to rise, it is important for Zimbabwe to take advantage of the geological potential to promote exploration for the commodities.
19. Mineral exploration being a high risky activity, is normally conducted by private companies with the requisite risky capital and technology. The Government's role is to reduce the risks associated with exploration so as to attract the private companies. This could start by government synthesizing available but scattered information on REE into documents that the public can easily access.
20. The owners of known REE deposits should present to Government their plans regarding evaluation of the economic viability of their deposits.
21. Since Government is embarking on mineral specific policies, a policy that includes promotion of the searching and exploitation of REE could be considered.

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